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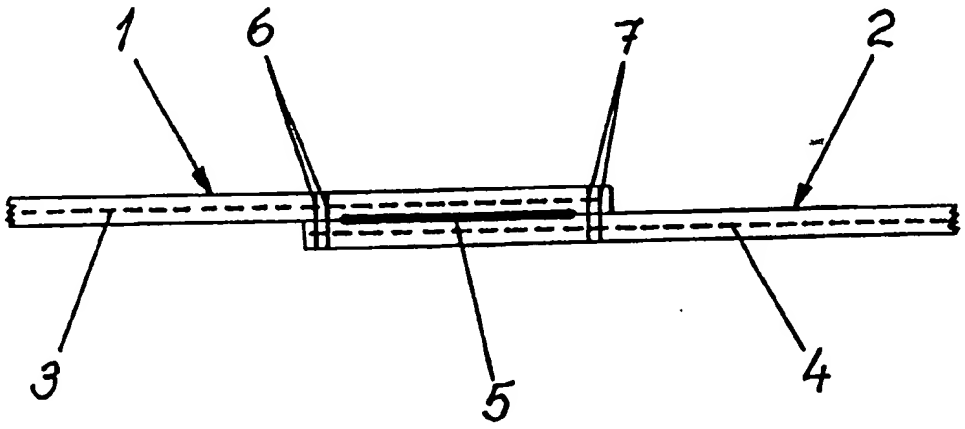

(57) Abstract

A lap joint between fabrics (1, 2) which are welded together in an elongate weld zone (5), whereby thread sewings (6, 7) are formed parallely to the weld zone (5), situated along each side of the weld zone (5), outside of the weld zone (5). The joint is made up by a method of joining weldable fabrics, comprising that two fabrics (1, 2) are laid overlapping against each other and are welded in an elongate weld zone (5), whereby thread sewings (6, 7) are formed parallely to the weld zone, along each side of the weld zone (5), outside of the weld zone (5). The thread sewings (6, 7) are situated so near the weld zone (5) that they relieve it. In this manner the fatigue strength of the joint is substantially increased, compared with a joint without thread sewings or a joint having a thread sewing within the weld zone proper.

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A lap joint between fabrics and a method of joining weldable fabrics.

The present invention relates to joining of fabric materials.

In joined fabrics the joints are often critical areas, with respect to sealing or strength, or both. For fabrics of weldable materials, or for such having a weldable outer layer, lap joining is among else used, whereby an elongate weld zone is formed i an overlapping area of the fabrics. It is also known to make thread sewings in such weld joints. Moreover, it is known to cover such a thread sewing with a fabric layer, which is welded in order to avoid leakage of liquid through the holes formed by the thread sewing. The purpose of the thread sewing mainly is to provide a mechanical reinforcement. The thread portions which penetrate the overlapping fabric layers will in joined fabrics which are not exposed to any tensile strain along the plane of the fabrics and transversely of the weld seam be situated mainly perpendicularly through the fabrics, at least when seen in a cross section of the weld seam. In such positions these thread portions have no ability to transfer forces along the plane of the fabrics, transversely of the weld joint. Not until the joint has been stretched in the transverse direction the thread portions will be situated in an oblique position relatively to the plane of the fabrics, and they are then able to transfer forces between the fabric layers in the plane of the fabrics. By tensile straining of welded lap seams the tensile forces will constitute a force couple, due to the thickness of the fabrics, whereby the seam area will be somewhat pivoted by a torque about a middle longitudinal axis through the weld seam, relatively to the plane of the fabrics outside of the joint area. Thereby the weld seam will assume a certain oblique position relatively to the plane of the fabrics, and the weld seam will be subjected to a force component which acts perpendicularly to the plane of the weld, at the same time as the weld is subjected to shear strain along its plane. A thread sewing in the weld seam will have a small effect against the strains to which the weld seam is subjected. The thread sewing may be able to compress the fabric layers along the weld, but this will not diminish the concentration of stresses along the so-called weld-toe, i.e. the longitudinal edge of the weld seam.

In accordance with the invention it has been realized that an elongate welding zone between two overlapping fabric layers can be efficiently reinforced with respect to fatigue by the provision of thread sewings outside of each side of the weld zone, by one or more thread sewings along each side, mainly immediately adjacent the weld zone or in a small distance therefrom. By such a joint the lifetime is increased, compared with merely a weld or a weld having sewings within the weld proper. The distance between the edges of the weld zone and the thread sewings, or the nearest sewings when two or more thread sewings on each side of the weld zone are used, may vary, for instance depending on the thickness of the fabrics and the width of the weld zone. Said distance may for instance be from a few millimeters and up to some tens of millimeters. The essential is that the thread sewings shall relieve the weld zone from strains.

When such a joint area is subjected to tension in the transverse direction, each fabric layer will be somewhat compressed by the thread sewings, which prevents perpendicular stresses in occuring at the weld-toe.

The combination of a weld zone and sewings outside of the weld zone brings about an improvement relatively to a weld zone without any sewing which with respect to lifetime can be expressed with a factor of 100.

The combination of a weld zone and sewings outside of the weld zone brings about a very important (significant) improvement relatively to the combination of a weld zone and sewings within the weld zone.

A concentration of shear stress will occur in each weld-toe in a weld zone when the joint is subjected to tension transversely of the joint. In a joint without sewings outside of the weld zone the joint will have a trend towards tear-out ("peeling") which produces forces laterally on the fabric plane and which causes large stretching of the fabric at each weld-toe. By placing the sewing outside of the weld the fabric surfaces will be pressed together, and stresses perpendicular to the fabric will be efficaciously avoided.

In a joint having sewings within the weld zone the small stretching which occurs within the weld zone will cause that the sewings have a minor effect. This is due to the fact that the sewings are not effective until they are situated obliquely (seen along the weld zone). With a tensile force S and a sewing angle of θ relatively to a direction perpendicularly to the fabric plane each sewing will give a force contribution of $F = S \sin \theta$. With sewings outside of each weld-toe the fabric deformations will be large in the sewing areas, and consequently the angle θ will be large. Each sewing will, consequently, give a large force contribution, which contributes to a levelling of the stress peaks in each weld-toe. Such a levelling of stress peaks is essential in order to increase the lifetime of a joint.

In the following the invention will be explained more detailed by means of an example shown in the accompanying drawing.

The Fig. shows diagrammatically and enlarged a section through a joint according to the invention, transversely of a weld seam.

Two fabrics 1 and 2, each of which being shown, in broken lines, as having an inner reinforcement 3, 4, for instance a fiber reinforcement, are superposed in an overlapping area, where the fabrics are joined in a weld zone 5. In a small distance outside of each side of the weld zone 5 thread sewings 6 and 7 are formed along the weld zone 5, in the example shown two sewings on each side of the weld zone 5. The joint is made up in that the fabrics 1 and 2 are first placed overlapping against each other and welded together in the weld zone, whereupon the thread sewings 6, 7 are sewn along the weld zone 5, in a certain distance therefrom.

If the joint is subjected to stretching in the transverse direction of the joint, i.e. that the fabrics 1 and 2 are subjected to forces to the right and to the left, respectively, as they are shown, the thread sewings 6 and 7 will relieve the weld zone 5. The weld zone 5 will primarily be loaded by shear forces and be somewhat deformed, by being stretched in the direction of the forces.

Thereby the thread portions which perforate the fabric layers 1 and 2 and which in a relaxed state mainly are in right angles to the fabric layers when seen in the shown section, will be situated somewhat obliquely, whereby the thread portions are able to absorb some of the tension. The most critical portions of the weld zone 5 with respect to stresses by such a loading are the edge portions of the weld zone, the so-called weld-toe along each side. When a weld without any thread sewing or a weld having a thread sewing within the weld zone is used, this will be subjected to the formation of fissures during repeated loadings, and these fissures will spread further into the weld and cause a substantial weakening thereof. When the thread sewing or sewings is/are situated immediately outside of the weld the formation of fissures is prevented, because the thread sewing or sewings absorbs/absorb the perpendicular forces and keeps/keep the fabric layers together. In this manner the lifetime of the joint is substantially increased.

The principle may be applied in several fields, such as for tents, clothes, bags and tarpaulins. A particular application is in large bags for use in oil recovery and for transportation of water in the sea, and where there is a danger of fatigue due to frequent loadings.

Claims.

1. A lap joint between fabrics (1, 2) which are welded together in an elongate weld zone (5), whereby thread sewings (6, 7) are formed parallelly to the weld zone (5), c h a r a c t e r i z e d i n that the thread sewings (6, 7) are situated along each side of the weld zone (5), outside of the weld zone (5).

2. A method of joining weldable fabrics, comprising that two fabrics (1, 2) are laid overlapping against each other and are welded in an elongate weld zone (5), whereby thread sewings (6, 7) are formed parallelly to the weld zone (5), c h a r a c t e r i z e d i n that the thread sewings (6, 7) are formed along each side of the weld zone (5), outside of the weld zone (5).

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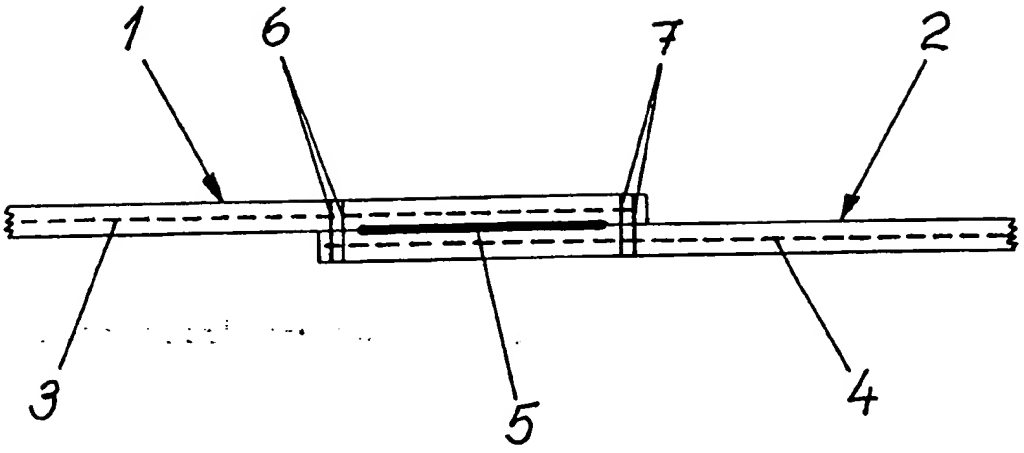

INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER

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B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: B29C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2592463 A (S.H. PHILLIPS), 8 April 1952 (08.04.52), column 5, line 30 - line 58; column 6, line 12 - line 39, figures 3,4 --	1-2
A	US 2962082 A (D.J. LENNEY), 29 November 1960 (29.11.60), figure 9 --	1-2
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2592463 A	08/04/52	NONE	
US 2962082 A	29/11/60	NONE	
GB 2146578 A	24/04/85	SE 459142 B,C	12/06/89
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